

# United States Patent [19]

Hasegawa et al.

[11] Patent Number: **4,605,622**

[45] Date of Patent: **Aug. 12, 1986**

[54] **PROCESS FOR PRODUCING GRANULAR FIXED ENZYMES OR MICROORGANISMS**

[75] Inventors: **Eiichi Hasegawa; Takamitsu Iida; Masahiro Sakamoto**, all of Hiratsuka, Japan

[73] Assignee: **Kansai Paint Co., Ltd.**, Hyogo, Japan

[21] Appl. No.: **551,928**

[22] Filed: **Nov. 15, 1983**

[51] Int. Cl.<sup>4</sup> ..... **C12N 11/04; C12N 11/02; C12N 11/10; C12N 11/12**

[52] U.S. Cl. .... **435/182; 435/177; 435/178; 435/179**

[58] Field of Search ..... **435/174, 177, 178, 179, 435/182**

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

4,138,292 2/1979 Chibata et al. .... 435/178  
4,195,129 3/1980 Fukui et al. .... 435/182  
4,334,027 6/1982 Klein et al. .... 435/182 X  
4,338,401 7/1982 Cremonesi ..... 435/182 X

4,347,320 8/1982 Borglum ..... 435/182 X  
4,350,765 9/1982 Chibata et al. .... 435/182 X  
4,546,081 10/1985 Yamada et al. .... 435/182 X

*Primary Examiner*—David M. Naff

*Attorney, Agent, or Firm*—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A granular fixed molded article of an enzyme or microorganism strain is prepared by adding dropwise a liquid composition, composed of (a) a hydrophilic photocurable resin having at least two ethylenically unsaturated bonds per molecule, (b) a photopolymerization initiator, (c) a water-soluble high-molecular-weight polysaccharide having the ability to become a gel upon contact with at least one polyvalent metal ion and (d) an enzyme or microorganism strain, to an aqueous medium containing a polyvalent metal ion to gel the composition in a granular form, and then irradiating actinic light on the resulting granular gel to cure the photocurable resin in the granular gel.

**12 Claims, No Drawings**